

WHAT IS CLAIMED IS:

1. An electromagnetic actuator for moving an object along a first direction and a second direction, comprising:
  - a magnetic force line generator including two homopolar parts
- 5 spaced with a clearance small enough for generating magnetic force lines including a first substantially linear portion and a second substantially linear portion due to a repelling force between said two homopolar parts;
- 10 a first actuating coil set connected to said object and arranged around said magnetic force line generator with a coil wall thereof substantially perpendicular to said first substantially linear portion for moving said object in said first direction in response to a first current density therein and said magnetic force lines; and
- 15 a second actuating coil set connected to said object and arranged around said magnetic force line generator with a coil wall thereof substantially perpendicular to said second substantially linear portion for moving said object in said second direction in response to a second current density and said magnetic force lines.
2. The electromagnetic actuator according to claim 1 wherein said first direction is a focusing direction, and said first actuating coil set includes a coil surrounding said magnetic force line generator.
- 20 3. The electromagnetic actuator according to claim 2 wherein said second direction is a tracking direction, and said second actuating coil set includes two coils positioned at two opposite sides of said magnetic force line generator.
- 25 4. The electromagnetic actuator according to claim 1 wherein said magnetic force line generator includes two permanent magnets

having respective N poles facing each other as said two homopolar parts.

5. The electromagnetic actuator according to claim 1 wherein said magnetic force line generator includes two permanent magnets having respective S poles facing each other as said two homopolar parts.
6. The electromagnetic actuator according to claim 1 for moving said object along said first and said second directions on micro levels.
10. The electromagnetic actuator according to claim 6 wherein said object is an objective lens holder of an optical head of an information writing/reading apparatus.
8. An electromagnetic actuator for moving an object along a first direction and a second direction, comprising:
  - 15 a first actuating coil set connected to said object for generating a first actuating force to move said object in said first direction in response to a first current therein and a first magnetic force;
  - 20 a second actuating coil set connected to said object for generating a second actuating force to move said object in said second direction in response to a second current therein and a second magnetic force; and
  - 25 a magnetic force line generator including two spaced homopolar parts which is surrounded by said first actuating coil set, and sandwiched by said second actuating coil set for providing said first and said second magnetic forces for said first and said second actuating coil sets, respectively, by generating magnetic force lines due to a repelling force therebetween.
9. The electromagnetic actuator according to claim 8 wherein said first

direction is a focusing direction, and said second direction is a tracking direction.

10. The electromagnetic actuator according to claim 9 wherein said first actuating coil set includes a coil holding said magnetic force line generator therein and said second actuating coil set consists of two coils disposed at two opposite sides of said magnetic force line generator, respectively.
11. The electromagnetic actuator according to claim 8 wherein said magnetic force lines includes a first substantially linear portion substantially perpendicular to a coil wall of said first actuating coil set, and a second substantially linear portion substantially perpendicular to a coil wall of said second actuating coil set.
12. The electromagnetic actuator according to claim 8 wherein said object is an objective lens holder of an optical head of an information writing/reading apparatus.
13. The electromagnetic actuator according to claim 12 for moving said object along said first and said second directions on micro levels.
14. The electromagnetic actuator according to claim 13 wherein said magnetic force line generator includes two permanent magnets having respective homopoles facing each other as said two homopolar parts.
15. An electromagnetic actuator for moving an object along a first direction, comprising:
  - a first actuating coil set connected to said object for generating a first actuating force to move said object in said first direction in response to a first current therein and a first magnetic force; and
  - a magnetic force line generator surrounded by said first

actuating coil set, and including two homopolar parts disposed with a clearance small enough for generating magnetic force lines including a first substantially linear portion due to a repelling force between said two homopolar parts, wherein said first substantially linear portion of magnetic force lines provides said first magnetic force for said first actuating coil set.

5 16. The electromagnetic actuator according to claim 15 wherein said first direction is a focusing direction, and said first actuating coil set includes a coil holding said magnetic force line generator therein.

10 17. The electromagnetic actuator according to claim 16 for further moving said object along a tracking direction perpendicular to said focusing direction.

15 18. The electromagnetic actuator according to claim 17 further comprising a second actuating coil set connected to said object for generating a second actuating force to move said object in said tracking direction in response to a second current therein and a second magnetic force.

20 19. The electromagnetic actuator according to claim 18 wherein said magnetic force lines further includes a second substantially linear portion due to said repelling force between said two homopolar parts, wherein said second substantially linear portion of magnetic force lines provides said second magnetic force for said second actuating coil set.

25 20. The electromagnetic actuator according to claim 19 wherein said second actuating coil set consists of two coils disposed at two opposite sides of said magnetic force line generator, respectively, each of which has a coil wall thereof substantially perpendicular to

said second substantially linear portion.

21. The electromagnetic actuator according to claim 15 wherein said magnetic force line generator includes two permanent magnets having respective homopoles facing each other as said two homopolar parts.  
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22. The electromagnetic actuator according to claim 15 wherein said first direction is a tracking direction, and said first actuating coil set includes two coils sandwiching said magnetic force line generator therebetween.
- 10 23. The electromagnetic actuator according to claim 22 for further moving said object along a focusing direction perpendicular to said tracking direction.
24. The electromagnetic actuator according to claim 23 further comprising a second actuating coil set connected to said object for generating a second actuating force to move said object in said focusing direction in response to a second current density therein and a second magnetic force.  
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25. The electromagnetic actuator according to claim 24 wherein said magnetic force lines further includes a second substantially linear portion due to said repelling force between said two homopolar parts, wherein said second substantially linear portion of magnetic force lines provides said second magnetic force for said second actuating coil set.  
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26. The electromagnetic actuator according to claim 25 wherein said second actuating coil set includes a coil holding said magnetic force line generator therein, which has a coil wall thereof substantially perpendicular to said second substantially linear portion.  
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